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A.D. 1880. April 3. N° 1370.
DIXON'S Specification.

(2 SHEETS)
SHEET 1.

FIG. 1.

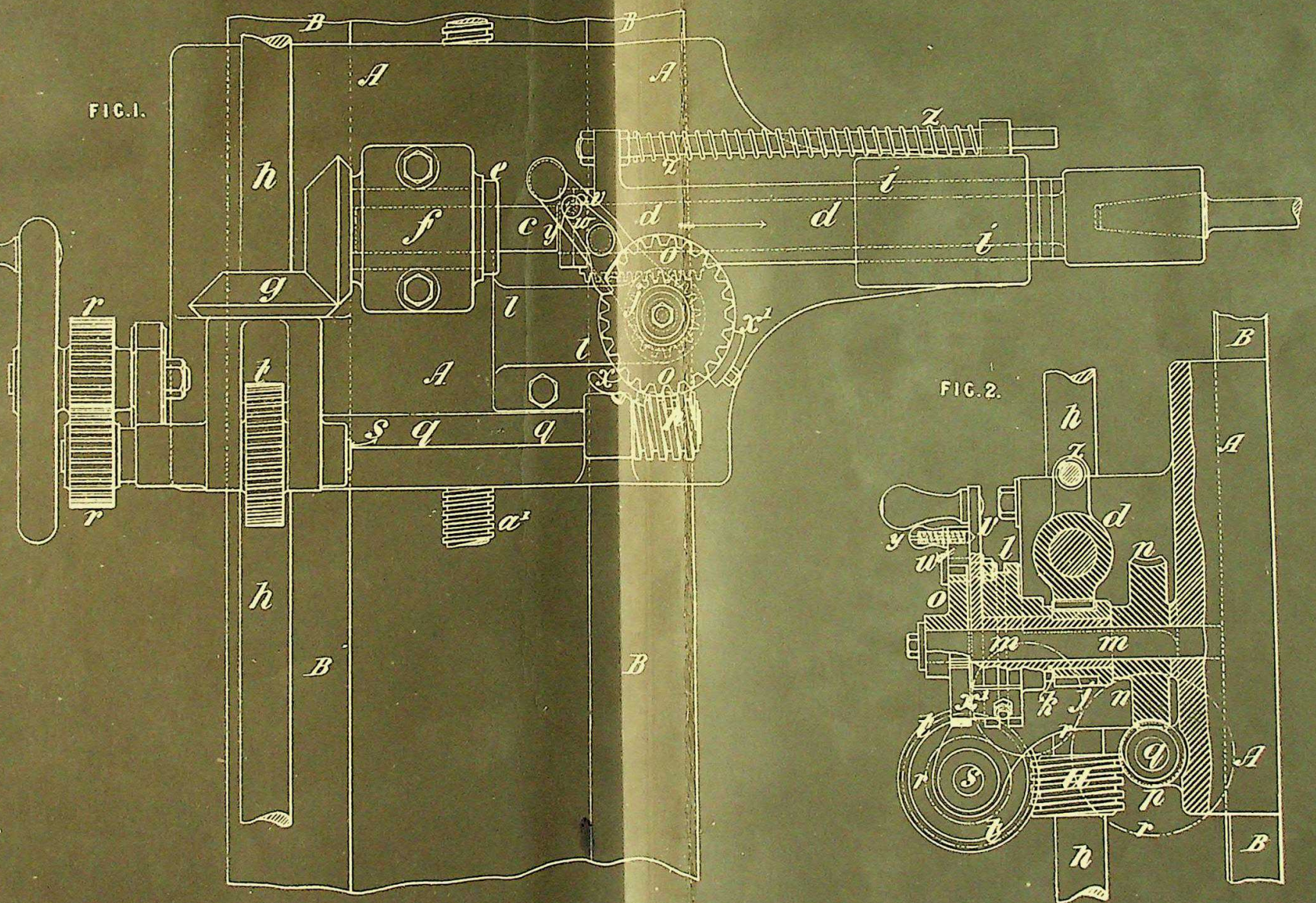


FIG. 2.

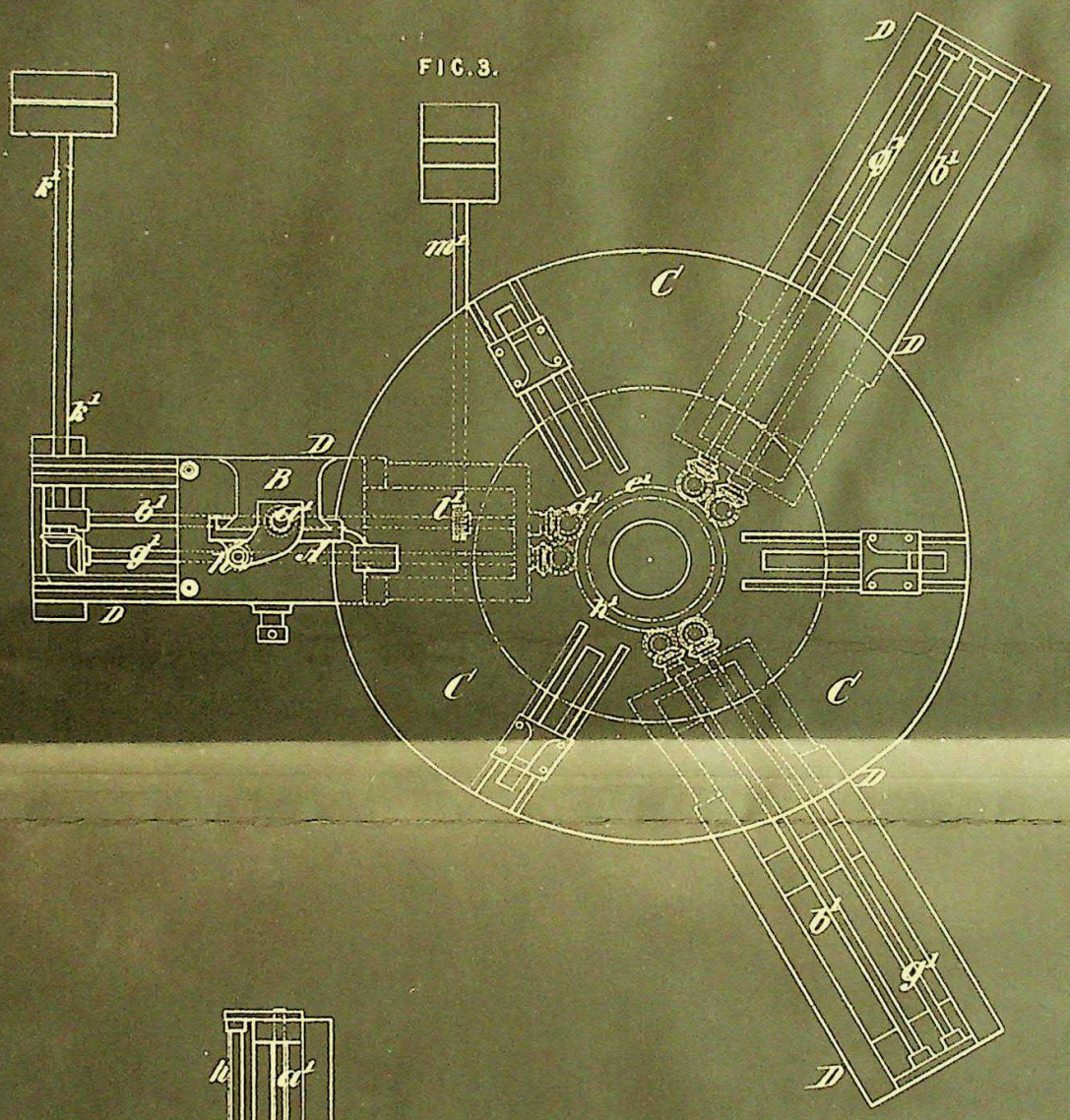
Malby & Sons, Photo-Litho.

London: Printed by George Edward Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty. 1880.

A.D. 1880. April 3. N° 1370.
DIXON'S Specification.

(2 SHEETS)
SHEET 2.

FIG. 3.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COPY HEREWITH OR OBTAIN FROM LIBRARY DIV. ALL PAGES SPECIFICATIONS DRAWINGS APPLICATION SERIAL NO. PATENT NUMBER 1370 CI SUB. DATE 1880

A.D. 1880, 3rd APRIL. N° 1370.

Apparatus for Drilling Boiler Rings, &c.

LETTERS PATENT to Samuel Dixon, of Marple, in the County of Chester, for an Invention of "IMPROVEMENTS IN APPARATUS ADAPTED TO BE EMPLOYED IN THE DRILLING OF BOILER RINGS AND OTHER METAL RINGS OR CYLINDERS, APPLICABLE IN PART TO OTHER USES."

PROVISIONAL SPECIFICATION left by the said Samuel Dixon at the Office of the Commissioners of Patents on the 3rd April 1880.

SAMUEL DIXON, of Marple, in the County of Chester. "IMPROVEMENTS IN APPARATUS ADAPTED TO BE EMPLOYED IN THE DRILLING OF BOILER RINGS AND OTHER METAL RINGS OR CYLINDERS, APPLICABLE IN PART TO OTHER USES."

My Invention relates to the apparatus wherein a number of drill frames or headstocks are arranged radially with respect to a circular turntable whereon boiler rings, or rings or cylinders of boiler plates, or of metal, are fixed in order that they may be drilled or perforated. In the apparatus as constructed in accordance with my Invention, each drill is arranged to be fed towards the work, and to make a quick return movement when the drilling operation is completed. The drill spindles are fitted to revolve in suitable bearings in or upon the headstock, and are also caused to slide in such bearings; or are fitted to slide in hollow shafts which are arranged to revolve in bearings; or are fitted to revolve in parts which are arranged to slide towards and from the work. The spindles are fed towards the work during the drilling, and are quickly withdrawn on the completion of each drilling operation. In one arrangement the feeding is effected by means of racks which are acted upon by pinions, which are connected by gearing and by vertical and horizontal shafts, with a second horizontal shaft which revolves upon the same axis as the turn table, so that all the drills are caused to act in unison. The feed motion is communicated to the rack pinion by means of a pawl which engages with a notched wheel. When the drilling is completed the pawl is released by the contact of a part of the pawl with an adjustable stop, whereby the said pawl is disengaged from the notch wheel. A spring or weight acting upon the sliding drill spindle, or the part in which it revolves, withdraws the drill, the pawl returning over the notches in the wheel, and coming in contact with a second adjustable stop, which causes it to engage with the notch-wheel, so that the parts are immediately ready for another operation. The pawl is provided with a sliding

finger which is acted upon by a spring, and when the pawl is disengaged engages with a notch or depression when the pawl is disengaged, the depression being so formed as that the pressure of the finger causes the withdrawal of the pawl clear of the notch-wheel. The drill spindles and the feed motions continue in uninterrupted motion during the drilling of a number of holes, it being only necessary to move the table to the required extent after each drilling operation. This part of my Invention may be employed for other purposes wherein a quick return movement is required. In other arrangements I employ cams to slide to and fro, the parts in which the drill spindles revolve, the said cams being so formed as to impart quick return movements to the drills; or I employ levers acted upon by means of revolving cranks, the parts being so arranged as to impart the said quick return movements. Each drill headstock is arranged to slide up and down upon a standard, which is adjustable upon a bed towards and from the turntable. The said headstock is raised and lowered by means of a screw, and the screws which act upon all the headstocks are connected together so that simultaneous action is obtained. Each screw receives motion through bevel gearing from a horizontal shaft, which is mounted in the bed upon which the stanard is fitted to slide. The inner ends of the horizontal shafts which actuate the several screws are connected by bevel and spur gearing, or by a suitable arrangement of gearing with a horizontal wheel which is fitted to revolve upon the same axis as the turn table. One of the horizontal shafts is provided or connected with fast and loose pullies, or is otherwise arranged to receive a revolving motion; or the said horizontal wheel is actuated by means of a special driving shaft, as may be preferred. When the said horizontal wheel is caused to revolve, a revolving movement is imparted to all the screws simultaneously, and the drill headstocks are caused to slide upwards or downwards according to the direction of revolution of the screws. In order that the screws may be driven in either direction, I employ a reversing arrangement, consisting of three pullies with cross and open straps, or any suitable reversing motion.

SPECIFICATION in pursuance of the conditions of the Letters Patent filed by the said Samuel Dixon in the Great Seal Patent Office on the 2nd October 1880.

SAMUEL DIXON, of Marple, in the County of Chester. "IMPROVEMENTS IN APPARATUS ADAPTED TO BE EMPLOYED IN THE DRILLING OF BOILER RINGS AND OTHER METAL RINGS OR CYLINDERS, APPLICABLE IN PART TO OTHER USES."

My Invention relates to apparatus wherein a number of drill frames or headstocks are arranged radially with respect to a circular turntable whereon boiler rings, or rings or cylinders of boiler plates or of metal are fixed in order that they may be drilled or perforated. According to the first part of my Invention each drill is arranged to be fed towards the work, and to make a quick return movement when the drilling operation is completed. The drill spindles are fitted to revolve in suitable bearings in or upon the headstock, and are also caused to slide in such bearings; or are fitted to slide in hollow shafts which are arranged to revolve in bearings; or are fitted to revolve in parts which are arranged to slide towards and from the work. The spindles are fed towards the work during the drilling, and are quickly withdrawn on the completion of each drilling operation. The feed motion is communicated by means of a pawl which engages with a notched wheel. When the drilling is completed the pawl is released by the contact of a part of the pawl with an adjustable stop, whereby the said pawl is disengaged from the notch wheel. A spring or weight acting upon the sliding drill spindle, or the part in which it revolves, withdraws the drill, the pawl returning over the notches in the wheel, and coming in contact with a second adjustable stop which causes it to engage with the notch-wheel, so that the parts are immediately ready for another operation. This part of my Invention may be employed for other purposes wherein a quick return movement is required. A second part of my Invention relates to the arrangements for raising and lowering the headstocks, and for actuating the drill spindles. Each headstock is raised and lowered by means of a screw, and the screws which act upon all the headstocks are connected together so that simultaneous action is obtained. Each screw receives motion through bevel gearing from a horizontal shaft, which is mounted in the bed upon which the standard is fitted to slide. The inner ends of the horizontal shafts which actuate the several screws are connected by bevel and spur gearing, or by a suitable arrangement of gearing with a horizontal wheel which is fitted to revolve upon the same axis as the turntable. One of the horizontal shafts is provided or connected with fast and loose pullies, or is otherwise arranged to receive a revolving motion; or the said horizontal wheel is actuated by means of a special driving shaft, as may be preferred. When the said horizontal wheel is caused to revolve, a revolving movement is imparted to all the screws simultaneously, and the drill headstocks are caused to slide upwards or downwards according to the direction of revolution of the screws. A corresponding arrangement imparts motion to the vertical shafts which actuate the drill spindles.

And in order that my Invention may be fully understood I have attached hereunto two Sheets of Drawings, to which I will now refer. In Sheet 1, which is drawn to a scale of about four and three quarter inches to the foot, and is illustrative of the first part of my Invention, Fig. 1 represents a front elevation, and Fig. 2 a vertical section of one of the drill headstocks. In the said Figs. A is the headstock, which is fitted to slide up and down upon a planed standard B, and *c* is the drill spindle which is fitted to revolve within a sliding sleeve *d*. The tail end of the spindle enters a hollow shaft *e* which revolves within a bearing *f*, and is provided with a bevel-wheel whereby it receives motion from a bevil-wheel *g* which is mounted in a bearing upon the headstock, and is arranged to slide upon a vertical driving shaft *h* when the headstock is raised or lowered. When the shaft *h* revolves the drill spindle is also caused to revolve. The sleeve *d* is arranged to

slide within a bearing *i*, and is prevented from revolving with the spindle. The said sleeve is provided with a spur rack, with which gears a spur-pinion *j*, which is fixed upon a hollow shaft *k*, which is mounted in a bearing formed in a bracket *l*. Upon a shaft *m* which passes through the shaft *k* are keyed a worm-wheel *n* and a notch-wheel *o*. A worm *p* upon a shaft *q* gears with the wheel *n*, and the shaft *q* is connected by a train of spur gearing *r* with a shaft *s*, upon which is fixed a worm-wheel *t*. A worm *u* arranged to slide upon the shaft *h* and to revolve with it gears with the wheel *t*, and imparts thereto a revolving motion which is communicated through the gearing *r*, the shaft *q*, and the worm and wheel *p*, *n*, to the shaft *m*. Upon the hollow shaft *k* is fixed or formed a lever *v* which carries a pawl *w* which is hinged upon a stud upon the said lever, and is adapted to engage with the notches in the wheel *o*. When the said pawl does not engage with the said wheel the shaft *m* revolves within the hollow shaft *k* without imparting motion thereto, but when the pawl engages with the said wheel the wheel acting upon the pawl carries around the said lever, whereby the hollow shaft *k* is caused to revolve, and as a consequence the rack pinion *j* acts upon the rack teeth on the sleeve *d*, and thereby causes it to slide in the bearing *i*. The bracket *l* is formed with a circular head, in which is turned a "vee-groove" adapted to retain tee headed bolts which secure two adjustable stops *x* and x^1. The action of the parts is as follows:—In the Drawings the pawl is represented as engaging with a notch in the wheel *o*, and as a consequence the revolving motion of the shaft *m* will be transmitted to the shaft *k*, and thereby to the pinion *j*, and the sleeve *d* will be slid in the indicated direction as the drilling proceeds. The stop x^1 is fixed in such a position upon the head of the bracket *l* as that when the drill has got through or penetrated to the required extent the heel of the pawl comes in contact with the stop, and the continued movement of the lever causes the withdrawal of the pawl from the notch in the wheel. In a recess bored in the tail of the pawl at *y* a conically pointed pin is fitted to slide, and is acted upon by a spring. When the pawl end is nearly out of the notch the conical end of the said pin enters a depression in the lever *v*, and by being forced into such depression moves the pawl quickly until it is quite clear of the wheel *o*, and as a consequence the forward feed of the drill ceases. A spiral spring *z* tends to force back the sleeve *d*, and when the pawl is clear of the wheel *o* the said spring slides the sleeve quickly back, thereby withdrawing the drill from the work. This backward movement of the sleeve turns back the hollow shaft and the lever *v* until the pawl comes in contact with the other stop *x* which forces the pawl into gear with the notch wheel, and the forward feed of the drill recommences. The positions of the two stops determine the traverse of the drill. It will be seen that the drill spindle revolves continuously in the same direction, it being only necessary to shift the work in the interval between the drill recommencing its forward traverse and its reaching the work. The wheels *r* are changeable in order that the rate of feed of the drill may be regulated. Any suitable form of spring or a weight may be used to draw back the sleeve *d*. The pawl may be arranged to turn the notch wheel if considered to be a preferable arrangement in any case. The arrangements for actuating the drill spindle and for transmitting motion to the shaft *m* may be varied as considered to be most suitable in each case. The pawl notch wheel and stops may be applied as a self-acting releasing and engaging apparatus for other purposes. Sheet 2 illustrates the second part of my Invention. Fig. 3 representing a plan, and Fig. 4 a part elevation of a drilling machine, which may be fitted with the parts illustrated in Sheet 1. In the said Figs. C represents the ordinary revolvable turn-table upon which the work is fixed, and D, D, D, in Fig. 3, are three beds upon which the vertical standards which carry the drill headstocks are fixed. On one of these beds is represented a standard B which may be the standard, a part of which is seen in Sheet 1. The three standards are adjustable upon their beds towards and from the centre of the table, as is usual, and one of the beds may be arranged to be moved into a line with one of the other beds. The number of the beds and standards may be varied. The drill head-

stock A is raised and lowered by means of a vertical screw a^1, and the drill is actuated by means of a vertical shaft h. The lower end of the said screw is provided with a bevel wheel which gears with a corresponding wheel which is fitted to slide upon and to turn with a horizontal shaft b^1, which is fitted to revolve in bearings in the bed. The inner end of this shaft is connected by bevil gearing with a vertical shaft which revolves in suitable bearings, and is provided with a spur-wheel d^1. The said spur-wheel gears with a larger wheel e^1 which is fitted to revolve upon the pillar f^1 which sustains the table, the latter revolving on the same axis as the said wheel e^1. There is a corresponding arrangement in connection with the shaft h, which is connected by bevel gearing with a second horizontal shaft g^1, which is connected by a second vertical shaft, and by bevel and spur-wheels, with a second wheel h^1 also mounted on the pillar f^1. Each of the three beds is provided with a corresponding arrangement of shafts and gearing connected with the wheels e^1 and h^1, each of which connects together the three horizontal shafts which actuate the screws or the upright shafts in the three standards, as the case may be. One of the shafts g^1 is connected by bevel gearing with a driving shaft k^1, which is provided with fast and loose driving pullies. When the strap is on the fast pulley all the shafts g^1 and h are caused to revolve in unison, and the drills are thereby actuated. Upon one of the shafts b^1 a worm-wheel l^1 is fixed, and with this gears a worm which is fixed or formed upon a driving shaft m^1, which is provided with a fast pulley and two loose pulleys adapted for cross and open straps, and forming a reversing motion whereby the shaft m^1, and, as a consequence, the shafts b^1 and the screws a^1, may be driven in one direction or the other to raise or lower the three headstocks simultaneously and in unison, as may be required. The arrangement might be varied by substituting for the wheel e^1 or h^1 a bevel wheel gearing with bevel pinions fixed on the ends of the shafts b^1 or g^1, as the case would be, and also the arrangements of and in connection with the driving shafts k^1 and m^1 may be varied to suit varying requirements.

Having now fully set forth and indicated the nature of my said Invention and the manner in which I carry the same into practical effect, I would have it to be understood that I claim :—

Firstly. The quick return movement for drill spindles, substantially as set forth and indicated hereinbefore, and in and by the Drawings in the accompanying Sheet 1.

Secondly. The notch wheel or an equivalent part, the pawl, and the adjustable stops for releasing and re-engaging the pawl with the notch wheel, substantially as and for the purposes set forth and indicated.

And, Lastly. Connecting the horizontal shafts in the radial beds of drilling machines with a central wheel having a common axis with the table in order to actuate the drills or to raise or lower the headstocks simultaneously, as the case may be, substantially as set forth and indicated.

In witness whereof, I, the said Samuel Dixon, have hereunto set my hand and seal, the First day of October, in the year of our Lord One thousand eight hundred and eighty.

SAMUEL DIXON. (L.S.)

Signed and sealed by the said
Samuel Dixon, in the presence of
EDWARD K. DUTTON,
41, John Dalton St.,
Manchester.
(Agent for the Patentee.)

LONDON: Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.

1880.